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(71) Applicant (for all designated States except US): **BASELL
POLYOLEFINE GMBH** [DE/DE]; Brühler Strasse 60,
50389 Wesseling (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RESONI, Luigi**

[IT/IT]; Via Arianuova, 56/B, I-44100 Ferrara (IT). **PEL-
LICONI, Anteo** [IT/IT]; Via Volta, 22, I-45030 Occhio-
bello (IT). **GARAGNANI, Enea** [IT/IT]; Viale Mons Na-
tale Mosconi, 75, I-44100 Ferrara (IT).

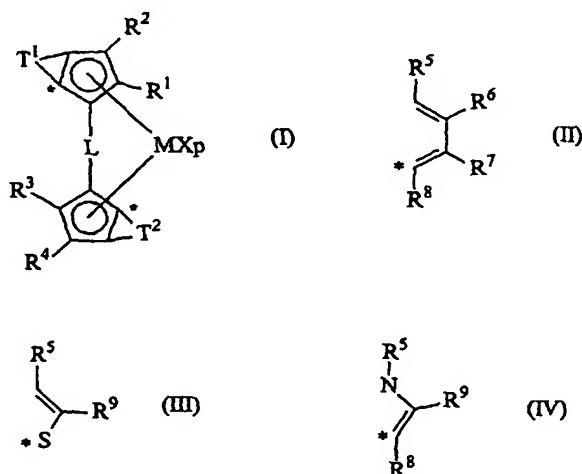
(74) Agent: **COLUCCI, Giuseppe**; Basell Poliolefine Italia
S.p.A, Intellectual Property, P.le G. Donegani, 12, I-44100
Ferrara (IT).

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(54) Title: 1-BUTEN COPOLYMERS AND PROCESS FOR PREPARING THEM



(57) Abstract: A process for preparing isotactic 1-butene copolymers containing up to 30% by mol of units derived from one or more alpha olefins of formula CH₂=CHZ, wherein Z is a C₃C₂₀ hydrocarbon group comprising contacting 1-butene and one or more of said alphaolefins under polymerization conditions in the presence of a catalyst system obtainable by contacting: (A) a metallocene compound of formula (I) (1) wherein: M is an atom of a transition metal; p is an integer from 0 to 3; X, same or different, are hydrogen atoms, halogen atoms, or an hydrocarbon group; L is a divalent bridging group; R¹ and R³ are hydrocarbon groups; R² and R⁴ are hydrogen atoms or hydrocarbon groups; T¹ and T², equal to or different from each other are a moiety of formula (II), (III) or (IV): wherein: the atom marked with the symbol * is bound the atom marked with the same symbol in formula (I); R⁵, R⁶, R⁷, R⁸ and R⁹, equal to or different from each other, are hydrogen or hydrocarbon groups; and (B) an alumoxane or a compound able to form an alkylmetallocene cation.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 02/100909 A (BASELL POLYOLEFINE GMBH ; RESCONI LUIGI (IT)) 19 December 2002 (2002-12-19) examples 14-19 table 3 claims 1-6,11,12	1-15
P,X	WO 02/100908 A (BASELL POLYOLEFINE GMBH ; RESCONI LUIGI (IT)) 19 December 2002 (2002-12-19) cited in the application examples 10-13 table 3 claims 1-6 catalysts A-1, A-2, A-3, A-5 on page 11 ----- -/--	1-15

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Gamb, V

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 03/042258 A (BASELL POLYOLEFINE GMBH ; RESCONI LUIGI (IT)) 22 May 2003 (2003-05-22) examples 3-6 table 1 claims 1-3	1-15
X	SUHM J ET AL: "Influence of metallocene structures on ethene copolymerization with 1-butene and 1-octene" JOURNAL OF MOLECULAR CATALYSIS. A, CHEMICAL, ELSEVIER, AMSTERDAM, NL, vol. 128, 1998, pages 215-227, XP002218351 ISSN: 1381-1169 page 222; examples 10-14; table 3	1-15
X	PATENT ABSTRACTS OF JAPAN vol. 0113, no. 49 (C-456), 14 November 1987 (1987-11-14) & JP 62 119213 A (MITSUI PETROCHEM IND LTD), 30 May 1987 (1987-05-30) abstract	11-15
X	DATABASE WPI Section Ch, Week 198607 Derwent Publications Ltd., London, GB; Class A17, AN 1986-044999 XP002280802 & JP 60 262804 A (MITSUI PETROCHEM IND CO LTD) 26 December 1985 (1985-12-26) abstract	11-15
X	EP 0 353 318 A (NESTE OY ; IDEMITSU PETROCHEMICAL CO (JP)) 7 February 1990 (1990-02-07) table 1 example 4 comparative examples 4,5	11-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 02100909	A	19-12-2002	WO 02100909 A1	19-12-2002
WO 02100908	A	19-12-2002	WO 02100908 A1	19-12-2002
			EP 1395619 A1	10-03-2004
WO 03042258	A	22-05-2003	WO 03042258 A1	22-05-2003
JP 62119213	A	30-05-1987	JP 1970461 C	18-09-1995
			JP 6104699 B	21-12-1994
JP 60262804	A	26-12-1985	JP 1849211 C	07-06-1994
			JP 5059922 B	01-09-1993
EP 0353318	A	07-02-1990	CA 1319783 C	29-06-1993
			JP 8016133 B	21-02-1996
			JP 63225605 A	20-09-1988
			EP 0353318 A1	07-02-1990
			CA 1309553 C	27-10-1992